WARZYN

PROJECT
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CORRECTIVE ACTION PLAN

CHICAGO COPPER AND CHEMICAL COMPANY
12685 WINCHESTER ROAD
CALUMET PARK, ILLINOIS

MARCH 1994

PREPARED FOR:
J.R. BRAMLETT
CALUMET PARK, ILLINOIS

• • •

PREPARED BY:
WARZYN INC.
ADDISON, ILLINOIS

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INTRODUCTION

Warzyn Inc. (Warzyn) was retained by Mr. J.R. Bramlett to develop a Corrective Action Plan for the Chicago Copper and Chemical Company (Chicago Copper) site located at 12685 Winchester Road, in Calumet Park, Illinois (Figure 1). The site was formerly used as a metal refinery and previous investigations have shown fill material over a portion of the site to contain elevated concentrations of barium. Other compounds including lead were detected less frequently and at lower concentrations. To determine the need and extent of corrective actions that may be required, Warzyn conducted a risk assessment of the site. The risk assessment evaluated the types and concentrations of compounds at the site to determine chemicals of concern, conducted an exposure assessment and characterized health risks. The results of the risk assessment and proposed corrective action plan are described in the following sections.

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BACKGROUND

Chicago Copper formerly operated as a metal refinery on a portion of a 16-acre site located at the northwest corner of Winchester Road and Burr Oak Avenue in Calumet Park, Illinois (Figure 1). Chicago Copper began operations prior to 1886 and continued to operate on the south portion of the site until 1970. Reportedly, the manufacturing facility was demolished in 1981. Chicago Copper used ores and petroleum coke as the primary raw materials in its barium manufacturing process. The residual material from the site's operation was reportedly disposed on-site. According to Marvin Moore, a former Chicago Copper employee, director, and shareholder, these residual materials consisted of barium sulfate, excess petroleum coke, ore impurities, complex barium, silica and iron compounds formed by the reaction of barium on the impurities in the ore. Small amounts of barium sulfide, barium sulfite, barium thiosulfate and barium carbonate may also have been present. These residual materials were taken out of process tanks inside the facility by shovel, and originally discarded out the back door. In later years, a buggy and track was used to transport the material out to a residue pile located on the south portion of the property. Marvin Moore worked at Chicago Copper from 1947 until after operations ceased in 1970. By virtue of his responsibilities as a chemical engineer at Chicago Copper, he is thoroughly familiar with its barium manufacturing process and the nature of residuals generated by the process.

The southeastern corner of the property was purchased in 1969 and leased to Airline Towing which continues to operate at the site. Mr. J.R. Bramlett purchased the remaining eastern portion of the property in 1988. In 1986 the Illinois Environmental Protection Agency (IEPA) inspected the property in response to an anonymous citizen compliant. The IEPA conducted a second inspection in 1987 and collected samples from the site for EP Toxicity and total metals analyses. The IEPA conducted a third inspection in 1989 and the site was added to the Comprehensive Environmental Response, Compensation and Liability System (CERCLIS) at the request of the IEPA.

On July 23, 1993, Warzyn and an environmental consultant representing Chicago Copper met with Mr. Steve Gobelman of the IEPA to discuss the potential development of the site in the future. Warzyn explained the history of the site and the results of past investigations at the site. Warzyn explained that excavating all impacted soils at the site and transporting the materials off-site for disposal would cost in excess of several million dollars. Warzyn proposed that a risk based approach be used to determine the need for corrective action based on the potential threat to human health and the environment. It was agreed at the meeting that the risk based approach would be conducted using an industrial land use exposure scenario based on the current and potential future use of the site.

In October 1993, the IEPA issued site specific cleanup objectives for the site (Appendix A). According to the IEPA, the site specific cleanup objectives included compounds not detected on-site, because the IEPA assumed that these other compounds potentially could be present on-site.

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SITE CHARACTERIZATION

3.1 SITE SETTING AND LAND USE

The property is located in a mixed industrial and residential area, on a parcel of land currently zoned industrial use (refer to Figure 2). The southern one-third of the property is used by Airline Towing for offices and as a maintenance shop and storage yard. The northern two-thirds of the property are vacant and undeveloped.

The site is bounded on the west by a ditch and active railroad lines, beyond which is the Rock Island Railroad switching yard (Figure 1). The switching yard extends approximately 1,500 feet west before any residential areas are encountered. The south portion of the site contains fenced areas and Airline Towing's offices, beyond which is the 127th Street overpass structure. This overpass structure is a built up 4-lane roadway which in effect serves as a physical barrier to the site from the residential area located south of it.

An approximate 6-foot high soil berm set back from the property boundary approximately 20 to 25 feet, and a 6-foot high chain link fence located on the property boundary line, run the entire length of the eastern side of the property. Winchester Avenue is located east of the fence, beyond which is a three block area of residential homes. East of this residential area is industrial property, the Illinois Central Railroad, and Interstate 57.

The east and west property boundaries come together to form a point at the north portion of the site, where the ditch on the west and the fence on the east join. A baseball field is located northeast of this point. Extending north of this area for approximately three-quarters of a mile are portions of the railroad switching yard, two closed landfills, and an industrial park.

3.2 GEOLOGY

Based on a review of regional geologic information, the shallow unconsolidated deposits in the vicinity of the site consist of the Wadsworth Till Member of the Wedron Formation (Berg, 1988). The Wadsworth Till, deposited during Wisconsinian glaciation, consists of gray clayey and silty clay till. The Wadsworth Till in the vicinity of the site is estimated to be approximately 70 to 100 feet thick based on regional information (Piskin, 1975).

The unconsolidated deposits unconformably overlie Silurian age dolomite and limestone bedrock. Based on regional information, the Silurian-age bedrock deposits are approximately 300 feet thick in the vicinity of the site (Hughes et al., 1966).

The soils at the site are designated as "E" on the Illinois Geological Survey Circular (1984) titled "Potential for Contamination of Shallow Aquifers in Illinois." Soils characterized as an "E", indicate the presence of uniform, relatively impermeable silty or clayey till with a thickness of at least 50 feet, with no evidence of interbedded sand and gravel (Berg et.al., 1984). Soils with this classification have little potential for contaminant migration. This characterization is used by the IEPA in its most recent revision of the underground storage tank program to characterize contaminant migration. The same concept applies to contaminant migration on this site.

3.3 HYDROLOGY

Surface water runoff from the site appears to move in a westerly direction, based on site topography. Constructed drainage ditches are present on the site to facilitate the movement of surface water runoff to a ditch located along the western site boundary, which drains approximately 500 feet to a sewer manhole riser located beneath the overpass of 127th Street, south of the site. Stormwater sewers are not present at the property. No on-site surface water bodies exist. The closest such feature is the Cal Sag Channel, located approximately three-quarters of a mile to the south.

3.4 SOILS

On the southern third of the site, the fill material is covered with washout material (i.e., leftover concrete) from concrete trucks. The northern two- thirds of the site, is sporadically covered with the washout material. This material is reported by Mr. Bramlett to be approximately two feet thick in existing areas. Based on a

report prepared by Harding Lawson & Associates (HLA), soils at the site consist of fill material underlain by native soils consisting of dark gray to brown silty lean clay. Total fill thickness (including cover) ranges from approximately two feet on the northern portion of the site, to approximately 12 feet in the southwestern portion. The fill consisted of gravelly sand/silt, and gravelly/silty material mixed with pieces of red tile, metals, plastic, wood, etc., overlying a wide variety of fill types including multi-colored materials in sandy/silty gravel matrix, building debris, some viscous material, and light blue to blue granular/crystalline slag like material (HLA, 1992).

3.5 HYDROGEOLOGY

Groundwater was encountered in 14 of the 47 soil borings performed at the property by HLA, at approximately 3.5 to 5 feet below surface grade. This is perched water and is not a source of potable drinking water for the area.

The Wadsworth Till in the vicinity of the site (beneath the fill material) generally would not provide sufficient groundwater yields to be used as a potable water supply. This is due primarily to the formation's low permeability. Values of hydraulic conductivity determined for a wide range of geologic materials (Freeze and Cherry, 1979, p. 29) indicates that hydraulic conductivity for glacial till may range from $1x10^{-4}$ cm/sec to $1x10^{-10}$ cm/sec. The average vertical conductivity for the clay till in the site area is estimated at 9.38×10^{-7} cm/sec (Cravens and Zahn, 1990).

The Silurian-age dolomite underlying the Wadsworth Till is a potential source of potable groundwater in the area. The dolomite yields water primarily from fractures and solution cavities, rather than from between grains comprising the rock (Hughes et al., 1966). The amount of groundwater available within a specific zone within the bedrock is dependent upon the interconnection of fractures and solution cavities.

The site and surrounding area obtain potable water from the municipal water system, which uses Lake Michigan as a water source. According to the Illinois State Water Survey (ISWS), there are no municipal wells within a one mile radius of the site. The only private well on record within a one mile radius is a well located on the southern portion of the site. According to the ISWS, the well is 1,449 feet deep. Mr J.R. Bramlett stated that the well is no longer in use.

3.6 SUMMARY OF PREVIOUS INVESTIGATION SOIL ANALYTICAL RESULTS

Three previous investigations have been conducted on site to characterize chemical impacts to the site soils. A summary of the soil analysis results from each investigation is set forth in Table 1. The following is a summary of the findings of each investigation.

ICEP, Inc. collected eight soil samples from fill material on the southern portion of the site in October 1989. These samples were analyzed for various heavy metals. Samples in which total metal concentrations were detected above their respective RCRA maximum contaminant concentrations for characteristic wastes were re-analyzed utilizing the E.P. Toxicity procedure. Barium was the only metal detected above its characteristic toxicity level using the E.P. Toxicity procedure. Four additional soil samples were subsequently collected and analyzed for total barium only. Results from the ICEP report are included in Appendix B-1.

Williams and Wentink, Inc. conducted a property transfer evaluation on the northern portion of the site in February 1990. As part of that evaluation, three samples were collected and analyzed for total barium and barium using the E.P. Toxicity procedure. No samples analyzed using the E.P. Toxicity procedure were in excess of RCRA's characteristic toxicity level for barium, although elevated levels of total barium were detected. Analytical results from the Williams and Wentink investigation are included in Appendix B-2.

HLA collected 47 native soil samples from beneath the fill across the site in 1992. The report shows that fill thicknesses ranges from approximately 2 feet in the northern portion of the site, to approximately 12 feet in the southwestern portion of the site. Water was encountered in scattered areas at depths ranging from approximately 3.5 to 5 feet in 14 of the 47 borings. Native soil samples beneath the fill material were analyzed for metals utilizing the Toxicity Characteristic Leaching Procedure (TCLP). In addition, soil samples were analyzed for volatile organic compounds (VOCs), and for semi-volatile organic compounds (SVOCs). Barium was the only metal detected above its RCRA characteristic toxicity level. These elevated barium levels were limited to the southwestern portion of the site. Only one sample of 12 analyzed from across the site had detectable levels of SVOCs. No VOCs were detected in any of the samples analyzed. Tables from the HLA report summarizing the analytical results are included in Appendix B-3.

The results of the previous investigations show that the site has been impacted by past industrial operations. Natural clay soils on the site are covered with fill which varies in depth from approximately 2 feet in the north portion of the

property to approximately 12 feet in the southwest portion. Water was encountered in soil borings drilled within the fill at depths ranging from approximately 3.5 to 5 feet. Much of the fill material appears to contain elevated concentrations of barium. In some areas on the south portion of the site, barium exceeded the TCLP concentrations of greater than 100 milligrams per liter (mg/l). Also, although elevated concentrations of total lead were detected on-site, lead did not leach from soils above its RCRA TCLP limit. Additionally, low concentrations of arsenic, cadmium, chromium, and silver were detected in the fill material, primarily on the south portion of the site. Although VOCs and SVOCs were analyzed from samples taken from across the site, only one sample had detectable levels of SVOCs, and none had detectable levels of VOCs.

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IDENTIFICATION OF CHEMICALS ABOVE SITE SPECIFIC CLEANUP OBJECTIVES

As part of the risk assessment process, a list of chemicals of potential concern (CPCs) are selected from the full list of chemicals detected on-site for which risk analysis will be performed. CPCs are those chemicals which, because of their toxicity, concentration, frequency of detection, and location within a medium (e.g., soil), or ability to be transported to other media might pose a health concern. In addition, chemicals detected above natural concentrations of the chemical in a medium or above regulatory health based limits are commonly retained as CPCs. The compounds identified as CPCs do not necessarily pose a health concern. Whether a chemical poses a health concern will be discussed in Section 5.

For the purposes of this risk assessment, chemicals detected on-site above the IEPA's site specific soil cleanup objectives (SSCO) were considered CPCs. The following metals were selected as CPCs in soil, because some soil samples had TCLP leachate concentrations above their SSCO:

- Barium
- Lead
- Cadmium
- Chromium
- Arsenic

Barium and lead were detected on site at the highest concentrations in soil in relation to their inherent toxicity, and therefore, were considered the two metals of primary concern. In addition, barium (but not lead) was detected above its TCLP limit, and for this reason, the potential for this metal to be leached to groundwater was considered a potential concern.

The other three metals (cadmium, chromium, and arsenic) were detected at lower concentrations in comparison to their inherent toxicity. In addition, none of these metals were detected above their TCLP limit, and therefore, they would unlikely be leached to groundwater. However, each of these metals was detected above their SSCO's, and therefore, they were retained as CPCs.

Silver was not considered a CPC because it was not detected above its SSCO in any soil samples.

Semi-volatile organic chemicals were analyzed in a portion of the soil samples collected at the site. PAHs were the only SVOCs detected in soil on site, and they were detected in 1 of 12 samples, 13 ft below ground surface. Based on their low frequency of detection, and the depth at which the detect was found, PAHs would unlikely pose a health concern. However, as a conservative measure, PAHs were retained as CPCs if they exceeded their SSCOs. Of the PAHs detected in soils, only the carcinogenic PAHs were detected above their respective SSCO's. The following carcinogenic PAHs were retained as CPC's:

- Benzo(a)anthracene
- Benzo(b)flouranthene
- Benzo(a)pyrene
- Chrysene
- Dibenzo(a,h)anthracene

5

EXPOSURE ASSESSMENT

This element of the RA identifies the subpopulations who live or work in the area of the site, and identifies whether these subpopulations have the potential to be exposed to the chemically impacted media. In general, people may be exposed to chemically impacted media in two ways. One, persons may directly contact a chemically impacted media (e.g., soil); or two, a chemically affected medium (e.g., groundwater) may migrate to a location where people come in contact with it (e.g., drinking water well). The term "exposure pathway" is used to describe the means by which people are exposed to chemically affected media. An exposure pathway must include the following elements to be complete:

- Source and mechanism of chemical release to the environment
- Environmental transport medium (e.g., air, groundwater) for the released chemical
- Point of potential human contact with the contaminated medium (referred to as the exposure point)
- Human contact (e.g., ingestion, dermal contact, or inhalation of a chemically affected medium)

If any of the four components of an exposure pathway are not present, then exposure will not take place. An example of a complete exposure pathway would be as follows:

> A chemical is leached from soil to groundwater, the chemically impacted groundwater flows to a drinking water well, and residents consume the water.

Only pathways considered to be complete are evaluated in a RA. The exposure assessment considers factors such as the physical location of contaminated media

in relation to potentially exposed populations to determine whether specific exposure pathways are complete. Since site conditions have the potential to change with time, the characteristic of chemical exposure may change. For this reason, an exposure assessment is performed for two site land use scenarios:

- Land use practices as they currently exist
- Reasonably foreseeable future land uses for the site

The level of health risk is proportional to the magnitude of chemical exposure. For this reason, a quantitative assessment of the magnitude of chemical exposure was conducted for complete exposure pathways. To accomplish this, information pertaining to the exposed populations were obtained, such as: the nature of the individuals (child vs. adult), the extent of contact with the impacted medium, and the length of time the exposure is likely to occur (e.g., years vs. lifetime). These population variables were then integrated with chemical concentration data to qualitatively assess the level of chemical exposure.

The following sections assess the two key elements of the exposure assessment:

- The populations potentially exposed to chemically impacted media
- The assessment of complete exposure pathways for each potentially exposed subpopulation

5.1 POTENTIALLY EXPOSED POPULATIONS

Site-specific conditions determine who may be exposed to chemically impacted media (e.g., soil, dust, sediment, air). The main site-specific conditions which determines whether exposure will occur is the location of human populations in relation to the contaminated media. The ways in which human populations use the site (e.g., workers vs. recreational users) and the surrounding area, determines to what degree people might be exposed to chemically impacted media. For these reasons, it is important to describe the populations who use the site, or live near the site, in relation to the location of chemically impacted media.

Within a RA, health risks are normally assessed for those subpopulations that would represent a reasonable maximally exposed (RME) subpopulation, rather than to each potentially exposed subpopulation. The RME subpopulation represents a group of persons for reasons of their location to contaminated media, inherent sensitivity to chemical exposure, and/or lifestyle are considered to be the subpopulation with the greatest potential to be exposed to a chemically impacted

media. Based on a population assessment (see preceding sections), construction workers were considered to represent the RME population for the site area, under current and future land use conditions. The following sections describe the reasons why construction workers were selected as the RME subpopulation, as opposed to other potentially exposed populations.

5.1.1 Potentially Exposed Populations Under Current Land Use Conditions

The property is currently zoned and used for industrial use. The southern portion of the property is used by Airline Towing for offices, and as a maintenance shop and storage yard. The northern two-thirds of the property are vacant and undeveloped. The site is in a mixed industrial and residential area (Figure 2). Based on current usage of the site and surrounding property, potentially exposed populations would include on-site employees, trespassers, and off-site residents. In addition, consistent with the current land use of the property, the site may be developed in the near future. For this reason, construction workers may be a potentially exposed population also.

Currently, employees are the subpopulation who are in closest proximity to the contaminated soils on-site. However, employees would not be expected to be exposed to impacted soils on-site. The present maintenance shop which houses the employees is located in the southern section of the property. As described in Section 2, the fill soils with the highly elevated concentrations of metals are located underneath approximately 2 ft of concrete washout material in this area. For this reason, presently there would not be the potential for employee exposure to these soils. Soils on other parts of the site are much less contaminated, and because of their location to the north of the garage area, would not pose a substantial concern to employees on-site.

Trespassers may cross the exposed soils on the northern portion of the property, but their exposures would be too brief in duration for significant exposure to occur. In addition, off-site residents although a potentially exposed population would not likely be exposed to on-site soils, because of their distance from the site and the existing security measures (i.e. fences).

The primary potential concern for chemical exposure would occur if the site is commercially developed. Mr. Bramlett intends to continue using the property for industrial purposes. This could involve the construction of industrial buildings, paving the site with parking areas, and general landscaping, as well as continuing to restrict access to the entire site.

During the construction process, covered soils in the southern section of the site may be temporarily exposed. The construction worker population building the facility would have the highest potential for exposure to the impacted soils.

because of their contact with the soils. For this reason, the construction worker population was selected as the RME population for which to quantitate health risk estimates, under current land use.

5.1.2 Potentially Exposed Populations Under Future Land Use Conditions

The current use of the property for industrial purposes is likely to continue into the foreseeable future, based on conversations with Mr. Bramlett, and telephone conversations with the planning departments of the Village of Calumet Park and the City of Blue Island. According to both planning departments, the site and surrounding properties will remain zoned as they are today unless an owner petitions for a zoning change. Mr. Bramlett has no intention to use the site for other than industrial or commercial uses. For this reason, the site's future type of land use was not considered to change. Therefore, potentially exposed populations would not be anticipated to be different in the future, because the type of land use is not likely to change.

5.2 EXPOSURE PATHWAY ANALYSIS

The following is a qualitative assessment of the potential for exposure to each impacted or potentially impacted media on site, under present and potential future site conditions, considering that the property will be used for industrial/commercial uses. Table 2 summarizes the results of the Exposure Pathway Analysis.

5.2.1 Air Exposure

Fugitive Dusts - Inhalation of fugitive dusts was not considered to be a complete exposure pathway for employees, trespassers or off-site residents, under present site conditions. The contaminated fill in the southern section of the site is covered with concrete washout material which is not erodable, and therefore, fugitive dusts would not be generated on this portion of the site.

Exposed fill material not under cover in the northern section of the site could generate fugitive dust if it becomes dry and is exposed to the wind or vehicular traffic. However, based on site conditions, the amount of fugitive dusts generated would be expected to be negligible, due to the coarse particulate size of the surficial cover material, and the existence of some vegetation (i.e., approximately 10 % of the surface area), which stabilizes the soil and prevents dust generation (Cowherd 1984). In addition, there is currently no vehicular traffic over the exposed fill.

In the future, inhalation of fugitive dusts would likely occur if excavation activities occur (i.e. under a construction scenario). For this reason, inhalation of

fugitive dusts was considered a complete exposure pathway for construction workers. While excavation activities are being performed, the potential for fugitive dust emissions will increase, because fill material would be disturbed. For this reason, the risk associated with the inhalation of fugitive dust will be assessed for construction workers.

5.2.2 Surface Water Exposure

Under current conditions, there are not surface water bodies or standing water on-site, and therefore, there is no exposure to surficial water. During rain events, surface water runoff from the site is captured by storm sewers and routed away from the site. Surface runoff does not contact the contaminated soils in the southern section of the site because of the concrete washout cover material, and therefore, transport of contaminated fill by erosion off-site would not be expected. In other portions of the site, the flat topography, vegetation, and coarseness of the surficial soils would minimize soil transport. For these reasons, exposure to surface waters was not considered a complete exposure pathway.

In the future, similar to present conditions, it is not anticipated that any water bodies will be constructed on the site. In addition, as part of any planned industrial development of the site, the coverage of surficial soils with structures, pavement, or vegetation would likely increase, decreasing the potential for surface water transport of soils from the site. For this reason, exposure to surface water or surface water runoff was not considered a complete exposure pathway in the future.

5.2.3 Soil Exposure

Employee exposure to chemically impacted soils was not considered a complete exposure pathway. Exposure to chemically impacted soils does not presently occur because fill material on the south portion of the site where employees work is covered with the concrete washout material. Exposed fill material on the north two-thirds of the site are not a concern because that portion of the site is vacant and no activities are performed there. Except for an occasional trespasser at this portion of the property, little human activities would be expected under present conditions.

Soil exposure was considered a complete exposure pathway for future construction workers. If these workers were to excavate contaminated soils as part of site development (i.e. foundation footings, utility line installation, etc.), they would likely be exposed to impacted fill material. It would be anticipated that the construction workers may contact fill material and incidentally ingest soils adhered to their hands.

5.2.4 Groundwater Exposure

Consumption of groundwater is not considered to be a complete exposure pathway. There is no current or intended future use of groundwater at the site. Records of the Illinois State Water Survey indicate the only well within a one mile radius of the site is on the south portion of the site. This well was installed to a depth of 1,449 ft, and is not in use.

According to the Calumet Park Public Works Department, the site and surrounding area obtain potable water from municipal water systems, which obtain water from Lake Michigan. In the future, it is anticipated that the site and surrounding area will continue to be serviced by municipal water systems. Therefore, persons within the area of the site would not likely consume water present beneath the site. In addition, soils under the site consist of 70 to 100 feet of native clay soil, with an Illinois Geological Survey classification of "E", indicating the presence of uniform, relatively impermeable silty or clayey till with a thickness of at least 50 feet, with no evidence of interbedded sand and gravel (Berg et.al., 1984). These sites have been identified as sites with very low probability for contaminant migration. Soils under such sites will prevent migration of metals and SVOCs due to the clay's low permeability, hydrophobic absorption capabilities, and high cation exchange capacity. For these reasons, there should not be migration of metals or PAHs to groundwater.

In the hypothetical scenario that contaminants did migrate to the groundwater, barium would be the only potential contaminant of concern, because it is the only analyte which has the potential to leach significantly from site soils, based on the TCLP analyses which were performed. In addition, barium is the most widespread compound and was detected at the highest concentrations in soils.

The concentration of barium in groundwater is controlled by sulfate concentrations in the groundwater. Barium would precipitate out of the groundwater in the presence of sulfate ions as barium sulfate (Clement, 1990). Sulfate is one of the major contributors to the overall mineral content of the groundwater in the site area (Roadcap and Cravens, 1992). The average sulfate concentration in the Lake Calumet Quad is 18.8 mg/l, and the average sulfate concentrations in the dolomite aquifer of Cook County is 285 mg/l (Cravens and Zahn, 1990). Groundwater that contains a sulfate concentration of 10 mg/l or greater will generally have a barium concentration much less than 1.0 mg/l (Gilkeson et al, 1983). Therefore, because the sulfate concentrations in the groundwater in the area of the site range from approximately 2 to 27 times the amount required to precipitate barium out of solution and keep soluble barium below 1.0 mg/l, it is highly unlikely that the MCL for barium of 2.0 mg/l would be exceeded. Therefore, barium is not a groundwater contaminant of concern.

5.3 SUMMARY OF EXPOSURE ASSESSMENT

Based on present and anticipated future usage of the site and surrounding property, potentially exposed populations would include on-site employees, off-site residents, trespassers, and on-site construction workers.

Presently, no complete exposure pathways exist to on-site employees, trespassers, or off-site residents. If the site is developed for further industrial/commercial purposes in the future, construction workers who may unearth some of the contaminated fill in the southern portion of the site may be exposed to the fill. The following exposure pathways were considered potentially complete for construction workers:

- Incidental ingestion of fill
- Dermal contact with fill
- Inhalation of fugitive dusts generated during excavating fill

The following section characterizes the health risks associated with each of these complete exposure pathways.

6

HEALTH RISK CHARACTERIZATION

Risk characterization integrates the toxicological information for the CPCs and estimated levels of chemical exposure, to arrive at an assessment of the potential health implications of chemical impacts on site. Health risks are proportional to the level of exposure to a chemically impacted medium. Currently, construction workers represent the reasonably maximum exposed population who may be exposed to the contaminated fill on-site beneath the concrete washout cover material.

To assess whether hypothetical soil exposure would cause a health concern to construction workers, a conservative quantitative approach was utilized. Standard risk equations and exposure assumptions which are considered by the U.S. EPA to represent a reasonable maximum level of exposure, were used to calculate both cancer (Table 3) and noncancer (Table 4) health risks (U.S. EPA 1991) associated with ingestion, and inhalation of fill material. Currently, dermal contact to soils is addressed qualitatively, because dermal toxicity values, and estimates of dermal absorption from soil are not available for most chemicals (U.S. EPA 1992). The U.S. EPA has provided a default rule of thumb that the risk associated with dermal contact with soil is no greater than the risk associated with soil ingestion. This rule has been used to assess the risk for the dermal route of exposure in this assessment.

The potential construction worker was assumed to contact fill material in the southern area of the site 5 days per week for 1 year, resulting in some soil ingestion (i.e., 480 mg/day), skin contact, and inhalation of airborne soil. Cancer slope factors which represent the measure of a chemicals carcinogenic potency, and reference doses which are the measure of a chemicals noncarcinogenic potency were used to characterize the toxicity of each CPC. In addition, it was assumed that the construction workers were exposed to the maximum concentration of each CPC detected on-site. Refer to Table 5 for a summary of the health risks estimated for construction workers.

Based on the estimated health risks, exposure to even maximum concentrations of the CPCs would not pose a health concern. The cumulative cancer risk was below $1x10^{-6}$ (i.e., $8x10^{-7}$), and the noncancer hazard index was less than one (i.e., 0.4).[1]

It should be noted that health risk for lead could not be quantitatively assessed, because there is no current U.S. EPA approved method available to quantitate risks to lead for adult populations, such as construction workers. However based on the average concentration of lead detected on-site (i.e., 900 mg/kg), the limited soil exposure to construction workers during construction would unlikely pose a health concern. Concentrations of lead in soil as high as 500 mg/kg are considered health protective for children chronically exposed to soils under a residential land use scenario by the U.S. EPA. The level of soil exposure which construction workers would be expected to encounter would likely be nearly an order of magnitude lower than a childs soil exposure under a residential land use scenario. For this reason, lead concentrations were not considered to pose a health concern to construction workers.

1. The health risk estimates provided in Table 5 were doubled to account for the risk from the dermal route of exposure.

7

SUMMARY AND CONCLUSIONS

Three previous investigations show that soils at the site have been impacted by past industrial operations. The primary contamination is in the fill. Natural clay soils on the site are covered with fill which varies in depth from approximately 2 feet to 12 feet. The fill is covered with approximately two feet of concrete washout material on the southern third of the property. Much of the fill material appears to contain elevated concentrations of barium. In the south portion of the site, barium exceeded the TCLP concentrations of greater than 100 mg/l at some locations. Elevated concentrations of total lead were detected in the same area, but lead did not leach from soils above its RCRA TCLP limit. Additionally, low concentrations of arsenic, cadmium, chromium, and silver were detected in the fill material, primarily on the southern portion of the site. Although VOCs and SVOCs were analyzed from samples taken from across the site, only one sample had detectable levels of SVOCs, and no samples had detectable levels of VOCs.

To determine the need and extent of corrective actions that may be required, Warzyn conducted a health risk assessment, based on current and probable future site conditions. It was determined that exposure to the contaminated fill would not pose a health concern; therefore, no corrective action is warranted.

Under current site conditions, there is no health risk, because no complete exposure pathways exist to on-site employees, trespassers, or off-site residents. The contaminated fill in the southern section of the property is covered with concrete washout material, which prevents exposure to the fill. In addition, soil and groundwater conditions limit contaminant migration from the fill.

Under probable future conditions, if the contaminated fill would be excavated, construction workers have the potential to be exposed to contaminated fill. Fill exposure potentially could occur by incidental ingestion, skin contact, and inhalation of fugitive dusts. However, exposure to maximum concentrations of

CPCs detected in fill would not pose a health concern. The cumulative cancer risk was below 1×10^{-6} and the noncancer hazard index was less than one.

The on-site soil is not a health concern, however, any off-site disposal of soil excavated during site construction activities will need to be handled appropriately. The excavated soil will need to be tested to determine the correct method of transport and off-site disposal.

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TABLE 1
SUMMARY OF ANALYTICAL DATA FROM PREVIOUS INVESTIGATIONS
CHICAGO COPPER AND CHEMICAL COMPANY
CALUMET PARK, ILLINOIS

	Site Specific Cleanup Objectives		IEPA & ICEP - 1989						Williams and Wentink, Inc. - 1990						HLA - 1992				
			Total (ppm)			EP Tox (ppm)			EP Tox (mg/L)			Total (mg/kg)			TCLP (mg/L)			Total (mg/kg)	
Parameter	TCLP (mg/L)	Total (mg/kg)	Range	Average	Frequency	Range	Average	Frequency	Range	Average	Frequency	Range	Average	Frequency	Range	Average	Frequency	Range	Frequency
arsenic	0.05		0.671-11.6	4.42	8 of 8	ND	--	2 of 8							ND-0.16	0.0167	19 of 47		
barium	2		507-24,329	8,335.75	8 of 8	2.66-1605	590.97	8 of 8	1.3 - 2.0	1.7	3 of 3	130-3200	1743.33	3 of 3	0.21-535	26.91	47 of 47		
cadmium	0.005		0.119-0.84	0.48	2 of 8	--	--	0 of 8							ND-0.098	0.013	26 of 47		
chromium	0.1		0.617-42.9	8.07	8 of 8	0.088-0.109	0.096	2 of 8							0.012-0.126	0.04	47 of 47		
lead	0.0075		133-1,596	889.25	8 of 8	0.139-1.22	0.377	8 of 8							ND-1.2	0.259	15 of 47		
silver	0.05		0.057-1.64	0.654	8 of 8	--	--	0 of 8							ND-0.042	0.023	3 of 47		
benzo(a)anthracene		0.0026																0.84	1 of 12
benzo(b)fluoranthene		0.0036																0.96	1 of 12
benzo(a)pyrene		0.0046																0.91	1 of 12
chrysene		0.03																1.3	1 of 12
dibenzo(a,h)anthracene		0.006																0.67	1 of 12
pyrene		4.2																0.76	1 of 12
Other non-carcinogenic PNAs																			
flouranthene		5.6																0.72	
phenanthrene																		1.5	
benzo(ghi)perylene																		1	
		total - 4.2																3.22	

Notes:
-- = Not Applicable
ppm = parts per million
mg/L = milligrams per liter
mg/kg = milligrams per kilogram

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Table 2
Summary of Exposure Pathway Analysis Results
Current Land Use - Present Conditions

Exposed Population	Environmental Medium	Exposure Point	Routes of Exposure	Pathway Currently Complete ?	Exposure Potential
Off-site Residents	Air	Off-site Residences	Inhalation	No	Negligible exposure because of the distance from site, and limited fugitive emissions expected due to coarse particle size, existence of some vegetation, and no vehicle traffic.
	Soil	Yards of offsite Residences	Inhalation, dermal contact, and incidental ingestion	No; fugitive dust emissions will be very low, therefore off-site soils would not be impacted.	None
	Groundwater	None; wells not located near site	Dermal contact and incidental ingestion	No; residents located nearest the site are supplied with municipal water derived from a surface water body far removed from the site.	None
	Surface Water	None; surface water bodies are not located near the site	None	No	None
	Food	Residential vegetable gardens	Ingestion	No; transport of chemical contamination from site is not anticipated, therefore, vegetable gardens will not be impacted.	None
Employees	Air	Site area	Inhalation	No	Negligible exposure because of the distance from site, and limited fugitive emissions expected due to coarse particle size, existence of some vegetation, and no vehicle traffic.

Table 2
Summary of Exposure Pathway Analysis Results
Current Land Use - Present Conditions

Exposed Population	Environmental Medium	Exposure Point	Routes of Exposure	Pathway Currently Complete ?	Exposure Potential
Employees continued	Soil	None; employees work inside or within areas covered with clean fill	None	No	None
	Groundwater	None; no wells in use on-site	None	No	None
	Surface Water	None; no surface water bodies are located onsite	None	No	None
	Food	None; no food crops are grown on or near the site	None	No	None

Table 2
Summary of Exposure Pathway Analysis Results
Current Land Use - Reasonable Future Conditions

Exposed Population	Environmental Medium	Exposure Point	Routes of Exposure	Pathway Potentially Complete ?	Exposure Potential
Construction Workers	Air	Area of excavation	Inhalation	Yes	High; exposure to dust emissions anticipated during construction activies.
	Soil	Excavations and soil stockpiles	Dermal contact and incidental ingestion	Yes	High; contact with soils likely during excavation activities
	Groundwater	None; no wells in use on-site	None	No	None
	Surface Water	None; no surface water bodies are located onsite	None	No	None
	Food	Not Applicable	None	No	None

TABLE 3

Equation and Exposure Factors Used to Calculate Cancer Risks Due to Soil Exposure

$$\text{Cancer Risk (unitless)} = \frac{C \times EF \times ED \times [(SF_o \times 10^{-6}\ kg/mg \times FI \times IR_s) + (SF_i \times IR_a \times (1/VF + 1/PEF))]}{BW \times AT \times 365\ days/yr}$$

where:

Parameters	Definition (units)	Parameter Value
C	chemical concentration in soil (mg/kg)	Refer to Table 1 for the maximum soil concentration
SF_i	inhalation cancer slope factor ((mg/kg-day)$^{-1}$)	Refer to Footnote 1
SF_o	oral cancer slope factor ((mg/kg-day)$^{-1}$)	Refer to Footnote 1
BW	adult body weight (kg)	70
AT	averaging time (yr)	70
FI	fraction ingestion from contaminated source (unitless)	0.1[2]
EF	exposure frequency (days/yr)	250
ED	exposure duration (yr)	1 (3)
IR_s	soil ingestion rate (mg/day)	480 (USEPA 1991)
IR_a	workday inhalation rate (m^3/day)	20
VF	soil-to-air volatilization factor (m^3/kg)	negligible volatilization[4]
PEF	particulate emission factor (m^3/kg)	4.63×10^9 (see Section 3.3.2 of RAGS-Part B)[5]

NOTE:

The above equation was developed based on information contained in Risk Assessment Guidance for Superfund (RAGS) - Parts A (U.S. EPA 1989) and - Part B (U.S. EPA 1991). The exposure values presented above are the default values provided in RAGS-Part B, unless otherwise specified. The default values are considered to represent a reasonable maximum level of exposure by the U.S. EPA.

FOOTNOTE:

1. The following are the cancer slope factors for the carcinogenic chemicals detected above regulatory limits.

Chemical	SF_i	SF_o
PAHs	6.1	7.3
Arsenic	50.0	1.8

TABLE 3

FOOTNOTE (continued):

2. Based on the small surface area of the former soil pile, in comparison to the site it was assumed that construction workers would contact soil within the former soil pile area approximately ten percent of the time (i.e., FI = 0.1).

3. It was assumed, for risk assessment purposes, that a construction worker may be in contact with the soil for a period of approximately one year, during construction operations.

4. The carcinogenic PAHs and metals are not volatile compounds, for this reason, volatilization from soils was considered to be negligible. Therefore, the inverse of the soil-to-air volatilization factor was considered to be zero within the risk equation.

5. The particulate emission factor (PEF) is used to estimate the amount of airborne soil (i.e., dust) which is present in ambient air.

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TABLE 4

Equation and Exposure Factors Used to Calculate Noncancer Risks Due to Soil Exposure

$$\text{Cancer Risk (unitless)} = \frac{C \times EF \times ED \times [((1/RfD_o) \times 10^{-6}\ kg/mg \times FI \times IR_s) + ((1/RfD_i) \times IR_a \times (1/VF + 1/PEF))]}{BW \times AT \times 365\ days/yr}$$

where:

Parameters	Definition (units)	Parameter Value
C	chemical concentration in soil (mg/kg)	Refer to Table 1 for the maximum soil chemical concentration
RfD_o	oral reference dose (mg/kg-day)	Refer to Footnote 1
BW	adult body weight (kg)	70
AT	averaging time (yr)	1
FI	fraction ingestion from contaminated source (unitless)	0.1[2]
EF	exposure frequency (days/yr)	250
ED	exposure duration (yr)	1[3]
IR_s	soil ingestion rate (mg/day)	480 (U.S. EPA 1991)
IR_a	workday inhalation rate (m^3/day)	20
VF	soil-to-air volatilization factor (m^3/kg)	negligible volatilization[4]
PEF	particulate emission factor (m^3/kg)	4.63×10^9 (see Section 3.3.2 of RAGS-Part B)[5]

NOTE:

The above equation was developed based on information contained in Risk Assessment Guidance for Superfund (RAGS) - Parts A (U.S. EPA 1989) and - Part B (U.S. EPA 1991). The exposure values presented above are the default values provided in RAGS-Part B, unless otherwise specified. The default values are considered to represent a reasonable maximum level of exposure by the U.S. EPA.

TABLE 4

FOOTNOTE:

1. The following are the reference doses for each of the noncarcinogenic chemicals detected at the site above regulatory limits. Reference doses are presented for both chronic and subchronic lengths of exposure. Where available, subchronic reference doses were used. However, when they were not available, chronic reference doses were used as a conservative substitute. A "--" means that a reference dose was not available.

	Chronic		Subchronic	
Noncarcinogen	RfD_i	RfD_o	RfD_i	RfD_o
Barium	$1x10^{-4}$	$7x10^{-2}$	$1.4x10^{-3}$	$7x10^{-2}$
Cadmium	--	$1x10^{-3}$	--	--
Chromium	$2x10^{-6}$	1.0	$2x10^{-5}$	10.0
Silver	--	$5x10^{-3}$	--	$5x10^{-3}$

2. Based on the small surface area of the former soil pile, in comparison to the entire site, it was assumed that construction workers would contact soil within the former soil pile area approximately ten percent of the time (i.e., FI = 0.1).

3. It was assumed, for risk assessment purposes, that a construction worker may be in contact with the soil for a period of approximately one year, during construction operations.

4. The carcinogenic PAHs and metals are not volatile compounds, for this reason, volatilization from soils was considered to be negligible. Therefore, the inverse of the soil-to-air volatilization factor was considered to be zero within the risk equation.

5. The particulate emission factor (PEF) is used to estimate the amount of airborne soil (i.e., dust) which is present in ambient air.

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TABLE 5

Industrial Construction Scenario
Health Risk Estimates

Cancer Risks

Chemical	Maximum Soil Concentration (mg/kg)	Cancer Risk
Arsenic	11.6 mg/kg	1.4×10^{-7}
Total PAHs	4.7 mg/kg	2.3×10^{-7}
	Total	**4×10^{-7}**

Non-Cancer Risks

Chemical	Maximum Soil Concentration (mg/kg)	Hazard Quotient
Barium	24,329	0.16
Cadmium	0.84	0.00039
Chromium	42.9	0.000093
Silver	1.64	0.00015
	Total (Hazard Index)	**0.2**

NOTE:

The health risk estimates presented above were based on the methods and equations presented in Tables 1, 2, and 3. A total cancer risk estimate of 1×10^{-6} (one-in-a-million) is normally not considered to pose an unaccepted cancer risk. A hazard index less than one, indicates that exposure to the levels of noncarcinogenic chemicals would not pose a health concern.

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T37N

QUADRANGLE LOCATION

north

0 2000 4000

SCALE IN FEET

NOTES

1. BASE MAP DEVELOPED FROM THE BLUE ISLAND, ILLINOIS 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1963, PHOTOREVISED 1973, PHOTOINSPECTED 1978.

FIGURE 1

Management Review
Other

Technical Review
Project Manager

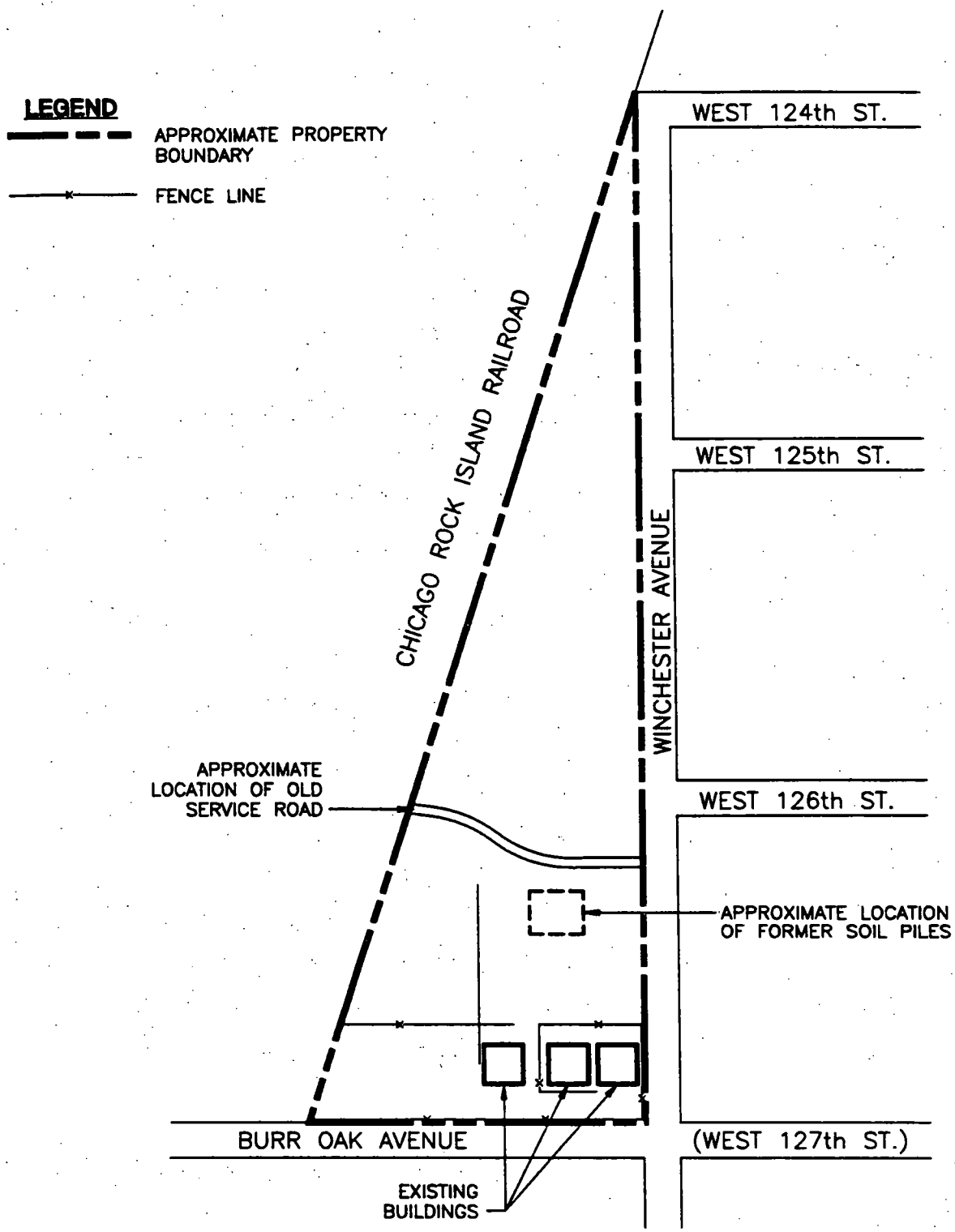
Graphic Standards CCM 11-17-93
Lead Professional

QUALITY CONTROL

Developed By: CCH	Drawn By: CCM	SITE LOCATION MAP	Drawing Number 20018201 A1
Approved By:	Date: 11-24-93		
Reference:		RISK ASSESSMENT CHICAGO COPPER AND CHEMICAL CALUMET PARK, ILLINOIS	
Revisions:			

WARZYN INC.

WARZYN



NOTES

1. BASE MAP DEVELOPED FROM A SITE PLAN DRAWN BY HARDING LAWSON ASSOCIATES, DATED NOVEMBER 25, 1992.

north

NOT TO SCALE

FIGURE 2

QUALITY CONTROL
Graphic Standards CCM 11-17-93
Lead Professional
Technical Review
Project Manager
Management Review
Other

Developed By: CCH Drawn By: CCM Approved By: Date: Reference: Revisions:	**SITE FEATURES MAP** RISK ASSESSMENT CHICAGO COPPER AND CHEMICAL CALUMET PARK, ILLINOIS	Drawing Number 20018201 A2 WARZYN

WARZYN INC.

Dl
10-4-93

A

IEPA Site Specific Soil Cleanup Objective

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

(217) 782-6760

October 4, 1993

Joseph D. Adams, Jr., P.E.
Warzyn, Inc.
2100 Corporate Drive
Addison, IL 60101

Re: L0310420002 -- Cook County
Calumet Park/Chicago Copper and Chemical
Superfund/Technical Reports
Cleanup Objectives

Dear Mr. Adams,

Enclosed you will find an updated copy of the IEPA Cleanup Objectives for the above referenced site. The Cleanup Objectives have been updated to include compounds not found, but assumed to be present.

The Agency would also like to give you a copy of the Agency's Risk Assessment Guidance. Although the guidance is for RCRA Clean Closure, the guidance applies to Pre-noticed sites as well.

Should you have any questions, please call.

Sincerely,

Timothy J. Murphy

Timothy J. Murphy
Bureau of Land, Division of Remedial Management, Remedial Project Management Section

cc: Andrew H. Perellis
Coffield Ungaretti & Harris
3500 Three First National Plaza, Chicago, IL 60602-4283

Gabriel M. Rodriquez,
Schiff, Hardin & Waite
7200 Sears Tower, Chicago, IL 60606

J. R. Bramlett
c/o Airline Towing
12658 S. Winchester, Calumet Park, IL 60643

TJM:tjm user\cuo1.let

Enclosure

BUREAU OF LAND
CLEANUP OBJECTIVES INFORMATION

PART C. GROUNDWATER STANDARDS (MG/L)

PARAMETER	CLASS I
Arsenic	0.05
Barium	2.0
Cadmium	0.005
Chromium	0.1
Lead	0.0075
Silver	0.05

35 IAC 620.410: Title 35: Environmental Protection
Subtitle F: Public Water Supplies
Subpart D: Groundwater Quality Standards
Section 620.410

SITE NAME: Calumet Park/Chicago Copper and Chemical Co.
SITE ID NO.: 0310420002

BUREAU OF LAND
CLEANUP OBJECTIVES INFORMATION

PART D. GROUNDWATER OBJECTIVES (MG/L)

PARAMETER	CLASS I	BASIS	ADL
Acenaphthene(1)(2)	0.42	35 IAC 620 Subpart F	--
Benzo(a)anthracene	0.00013	35 IAC 620 Subpart F	0.00013
Benzo(b)fluoranthene	0.00018	35 IAC 620 Subpart F	0.00018
Benzo(a) pyrene	0.00023	35 IAC 620 Subpart F	0.00023
Chrysene	0.0015	35 IAC 620 Subpart F	0.0015
Dibenzo(a,h)anthracene	0.0003	35 IAC 620 Subpart F	0.0003
Fluorene(2)	0.28	35 IAC 620 Subpart F	--
Pyrene(2)	0.21	35 IAC 620 Subpart F	--
Anthracene(1)	2.1	35 IAC 620 Subpart F	--
Other Non-carcinogenic PNAs	0.21	35 IAC 620 Subpart F using pyrene	
Acenaphthylene(1)			0.01
Benzo(g,h,i)perylene			0.00076
Phenanthrene			0.0064
Benzo(k)fluoranthene(1)	0.00017	35 IAC 620 Subpart F	0.00017
Fluoranthene(1)(2)	0.28	35 IAC 620 Subpart F	--
Naphthalene(1)	0.025	35 IAC 620 Subpart F	--
Indeno(1,2,3-c,d) pyrene(1)	0.00043	35 IAC 620 Subpart F	0.00043

ADL: Acceptable Detection Limit; lowest Practical Quantitation Limit (PQL) from SW846.

35 IAC 620. Subpart F: Title 35: Environmental Protection
Subtitle F: Public Water Supplies
Subpart F: Health Advisories

(1): Chemical not detected, but expected to be present.

(2): Mixture 1: In addition to meeting the individual Class I groundwater objectives indicated in the above tables, the following equation must be satisfied to protect against liver, kidney, and blood toxicity.

$$\frac{\text{(acenaphthene)}}{0.42\ \text{mg/l}} + \frac{\text{(fluoranthene)}}{0.28\ \text{mg/l}} + \frac{\text{(fluorene)}}{0.28\ \text{mg/l}} + \frac{\text{(pyrene)}}{0.21\ \text{mg/l}} \leq 1.0$$

SITE NAME: Calumet Park/Chicago Copper and Chemical Co.
SITE ID NO.: 0310420002

BUREAU OF LAND
CLEANUP OBJECTIVES INFORMATION

PART E. SOIL OBJECTIVES (MG/KG)

PARAMETER	TYPE A	BASIS	ADL
Arsenic (TCLP)	0.05 (mg/l)	35 IAC 620.410	--
Barium (TCLP)	2.0 (mg/l)	35 IAC 620.410	--
Cadmium (TCLP)	0.005 (mg/l)	35 IAC 620.410	--
Chromium (TCLP)	0.1 (mg/l)	35 IAC 620.410	--
Lead (TCLP)	0.0075 (mg/l)	35 IAC 620.410	--
Silver (TCLP)	0.05 (mg/l)	35 IAC 620.410	--
Acenaphthene(1)	8.4	20 x 35 IAC 620 Subpart F	--
Benzo(a)anthracene	0.0026	20 x 35 IAC 620 Subpart F	0.0087
Benzo(b)fluoranthene	0.0036	20 x 35 IAC 620 Subpart F	0.012
Benzo(a) pyrene	0.0046	20 x 35 IAC 620 Subpart F	0.015
Chrysene	0.03	20 x 35 IAC 620 Subpart F	0.1
Dibenzo(a,h)anthracene	0.006	20 x 35 IAC 620 Subpart F	0.02
Fluorene	5.6	20 x 35 IAC 620 Subpart F	--
Pyrene	4.2	20 x 35 IAC 620 Subpart F	--
Anthracene(1)	42.0	20 x 35 IAC 620 Subpart F	--
Other Non-carcinogenic PNAs	4.2	20 x 35 IAC 620 Subpart F using pyrene	
Acenaphthylene(1)			0.66
Benzo(g,h,i)perylene			0.051
Phenanthrene			0.66
Benzo(k)fluoranthene(1)	0.0034	20 x 35 IAC 620 Subpart F	0.011
Fluoranthene(1)	5.6	20 x 35 IAC 620 Subpart F	--
Indeno(1,2,3-c,d) pyrene(1)	0.0086	20 x 35 IAC 620 Subpart F	0.029
Naphthalene	0.025	35 IAC 620 Subpart F	--

ADL: Acceptable Detection Limit; lowest Practical Quantitation Limit (PQL) from SW846.

35 IAC 620.410: Title 35: Environmental Protection
Subtitle F: Public Water Supplies
Subpart D: Groundwater Quality Standards
Section 620.410

35 IAC 620. Subpart F: Title 35: Environmental Protection
Subtitle F: Public Water Supplies
Subpart F: Health Advisories

TCLP: Toxicity Characteristic Leaching Procedure

(1): Chemical not detected, but expected to be present.

SITE NAME: Calumet Park/Chicago Copper and Chemical Co.
SITE ID NO.: 0310420002

B-1

SUMMARY OF SOIL ANALYTICAL RESULTS- ICEP, INC. INVESTIGATION

Junction Avenue - Scher , In
1-219-322-2560 ● 1-800-428-3311

REPORT TO:
Pat Solliday
ICEP
3468 Watling Road
East Chicago, IN 46312

Airline Towing
Blue Island, IL

Date: 11/6/89
Recd: 10/4/89
WO #: 22-0030

Laboratory Smp ID No.:	AA10361	AA10361	AA10362	AA10362	AA10363	AA10363	
DESCRIPTION: ——> (Unless otherwise noted; results in parts per million - ppm) PARAMETERS: ↓	685-1 10/3/89 TOTAL	685-1 10/3/89 EP TOXICITY	685-2 10/3/89 TOTAL	685-2 10/3/89 EP TOXICITY	685-3 10/3/89 TOTAL	685-3 10/3/89 EP TOXICITY	
Arsenic	0.671		2.15		0.904		
Barium	1279	10.4	6896	693	11666	1605	
Cadmium	<0.002		<0.002		<0.002		
Chromium	2.11		6.13	0.088	0.617		
Lead	133	0.49	1134	0.224	290	0.139	
Mercury	<0.0001		<0.0001		0.0784		
Selenium	<0.01		0.066		<0.01		
Silver	0.057		0.253		1.09		

Certified by: Catherine A. Hinton

BPM INDUSTRIES
1 Junction Avenue - Schererville, Indian 75
1-219-322-2560 ● 1-800-428-3311

REPORT TO:
Pat Solliday
ICEP
3468 Watling Road
East Chicago, IN 46312

Airline Towing
Blue Island, IL

Date: 11/6/89
Recd: 10/4/89
WO #: 22-0030

Laboratory Smp ID No.:	AA10364	AA10364	AA10365	AA10365	AA10366	AA10366
DESCRIPTION: —>	685-4	685-4	685-5	685-5	685-6	685-6
Unless otherwise noted; results in parts per million - ppm] PARAMETERS: ↓	10/3/89 TOTAL	10/3/89 EP TOXICITY	10/3/89 TOTAL	10/3/89 EP TOXICITY	10/3/89 TOTAL	10/3/89 EP TOXICITY
Arsenic	3.95		9.4	<0.001	11.6	<0.001
Barium	4756	544	507	37.7	1255	2.66
Cadmium	<0.002		0.84		0.119	
Chromium	3.29		42.9	0.109	1.74	
Lead	1267	1.22	1596	0.393	1230	0.183
Mercury	0.0702		0.1666		0.0275	
Selenium	<0.01		0.52		<0.01	
Silver	1.64		0.440		0.165	

Certified by:

11 Junction Avenue - Schererville, Indiana 46375
1-219-322-2560 ● 1-800-428-3311

REPORT TO:
Pat Solliday
ICEP
3468 Watling Road
East Chicago, IN 46312

Airline Towing
Blue Island, IL

Date: 11/6/89
Recd: 10/4/89
WO #: 22-0030

Laboratory Smp ID No.:	AA10367	AA10367	AA10368	AA10368			
DESCRIPTION: ——>	685-7	685-7	685-8	685-8			
Unless otherwise noted; results in parts per million - ppm)	10/3/89	10/3/89	10/3/89	10/3/89			
PARAMETERS:	TOTAL	EP TOXICITY	TOTAL	EP TOXICITY			
Arsenic	3.84		2.86				
Barium	24329	621	15998	1214			
Cadmium	<0.002		<0.002				
Chromium	3.59		4.18				
Lead	779	0.140	685	0.227			
Mercury	<0.0001		<0.0001				
Selenium	<0.01		<0.01				
Silver	1.00		0.584				

Certified by: Pat... Dal... (illegible)

B-2

SUMMARY OF SOIL ANALYTICAL RESULTS-
WILLIAMS AND WENTINK, INC.
INVESTIGATION

1603EMSCERT

CERTIFICATE OF ANALYSIS

CORRESPOND TO	SAMPLE
EMS LABORATORIES, INC. 8205 S. CASS AVE. SUITE 106 DARIEN, IL 60559 (708)969-9030	LAB SAMPLE ID: C119710 DATE PRINTED : 14-FEB-90 DATE RECEIVED: 01-FEB-90 DATE COMPLETE: 09-FEB-90

REPORT TO	BILL TO
WILLIAMS AND WENTINK, INC. SUITE # 201 414 PLAZA DR. WESTMONT, IL 60559 ATTN: MARY JO WILLIAMS	WILLIAMS AND WENTINK, INC SUITE # 201 414 PLAZA DR. WESTMONT, IL 60559 ATTN: GLEN WENTINK

DESCRIPTION

DATE SAMPLED : 01-FEB-90 TIME : 12:00 PO NUMBER : HOLD
DESCRIPTION : STATION # 001-DIRT

ANALYSIS

ACID DIGESTION OF LEACHATE SAMPLES FOR FAA OR ICP SW846-3010
ANALYST : M. BEAVER DATE : 07-FEB-90 INSTRUMENT : MANUAL REP : 0
PREP : EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310

PARAMETER	RESULT	DET LIM
FINAL WEIGHT OR VOLUME	50 ML	
INITIAL WEIGHT OR VOLUME	50 ML	

BARIUM FAA SW846-7080
ANALYST : L. JANATKA DATE : 08-FEB-90 INSTRUMENT : FAA REP : 0
PREP : ACID DIGESTION OF LEACHATE SAMPLES FOR FAA OR ICP SW846-3010
PREP : EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310

PARAMETER	RESULT	DET LIM
BARIUM	1.3 MG/L	0.2

PH (SOIL) SW846-9045
ANALYST : H. GRIFFIN DATE : 05-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
PH	7.6 STD. UNITS	0.1

ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS FOR FAA OR ICP SW846-3050
ANALYST : M. BEAVER DATE : 06-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
FINAL WEIGHT OR VOLUME	2.60 GRAMS	
INITIAL WEIGHT OR VOLUME	50 ML	

XTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310
ANALYST : M. BEAVER DATE : 05-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
TOTAL SAMPLE WEIGHT	100 GRAMS	
SOLID PORTION	100 GRAMS	
LIQUID PORTION	0 ML	
INITIAL DI ADDED	1600 ML	
FINAL DI ADDED	301 ML	
INITIAL PH	8.0	
FINAL PH	4.7	
TOTAL ACID ADDED	99 ML	
VOLUME EXTRACT FILTERED	2000 ML	
TOTAL VOLUME FILTRATES	2000 ML	

ARIUM FAA SW846-7080
ANALYST : L. JANATKA DATE : 08-FEB-90 INSTRUMENT : FAA REP : 1
PREP : ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS FOR FAA OR ICP SW846-3050

AMETER	RESULT	DET LIM
ARIUM	1900 MG/KG	4.0

UALITY ASSURANCE OFFICER: Christine Sadler

603EMSCERT

CERTIFICATE OF ANALYSIS

---------- CORRESPOND TO ---------- SAMPLE ----------

EMS LABORATORIES, INC.
8205 S. CASS AVE. SUITE 106
DARIEN, IL 60559
(708)969-9030

LAB SAMPLE ID: C119711
DATE PRINTED : 14-FEB-90
DATE RECEIVED: 01-FEB-90
DATE COMPLETE: 09-FEB-90

---------- REPORT TO ---------- BILL TO ----------

WILLIAMS AND WENTINK, INC.
SUITE # 201
414 PLAZA DR.
WESTMONT, IL 60559
ATTN: MARY JO WILLIAMS

WILLIAMS AND WENTINK, INC
SUITE # 201
414 PLAZA DR.
WESTMONT, IL 60559
ATTN: GLEN WENTINK

---------- DESCRIPTION ----------

DATE SAMPLED : 01-FEB-90 TIME : 12:10 PO NUMBER : HOLD
DESCRIPTION : STATION # 002-LIME FILL

---------- ANALYSIS ----------

ACID DIGESTION OF LEACHATE SAMPLES FOR FAA OR ICP SW846-3010
ANALYST : M. BEAVER DATE : 07-FEB-90 INSTRUMENT : MANUAL REP : 0
PREP : EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310

PARAMETER	RESULT	DET LIM
FINAL WEIGHT OR VOLUME	50 ML	
INITIAL WEIGHT OR VOLUME	50 ML	

BARIUM FAA SW846-7080
ANALYST : L. JANATKA DATE : 08-FEB-90 INSTRUMENT : FAA REP : 0
PREP : ACID DIGESTION OF LEACHATE SAMPLES FOR FAA OR ICP SW846-3010
PREP : EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310

PARAMETER	RESULT	DET LIM
BARIUM	1.8 MG/L	0.2

PH (SOIL) SW846-9045
ANALYST : H. GRIFFIN DATE : 05-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
PH	12.1 STD. UNITS	0.1

ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS FOR FAA OR ICP SW846-3050
ANALYST : M. BEAVER DATE : 06-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
FINAL WEIGHT OR VOLUME	2.60 GRAMS	
INITIAL WEIGHT OR VOLUME	50 ML	

XTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310
ANALYST : M. BEAVER DATE : 05-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
TOTAL SAMPLE WEIGHT	100 GRAMS	
SOLID PORTION	100 GRAMS	
LIQUID PORTION	0 ML	
INITIAL DI ADDED	1600 ML	
FINAL DI ADDED	0 ML	
INITIAL PH	11.3	
FINAL PH	6.1	
TOTAL ACID ADDED	400 ML	
VOLUME EXTRACT FILTERED	2000 ML	
TOTAL VOLUME FILTRATES	2000 ML	

ARIUM FAA SW846-7080
ANALYST : L. JANATKA DATE : 08-FEB-90 INSTRUMENT : FAA REP : 1
PREP : ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS FOR FAA OR ICP SW846-3050

RAMETER	RESULT	DET LIM
ARIUM	130 MG/KG	4.0

UALITY ASSURANCE OFFICER: Christine Sadler

603EMSCERT

C E R T I F I C A T E O F A N A L Y S I S

CORRESPOND TO ---------- SAMPLE

EMS LABORATORIES, INC.
8205 S. CASS AVE. SUITE 106
DARIEN, IL 60559
(708)969-9030

LAB SAMPLE ID: C119712
DATE PRINTED : 14-FEB-90
DATE RECEIVED: 01-FEB-90
DATE COMPLETE: 09-FEB-90

REPORT TO ---------- BILL TO

WILLIAMS AND WENTINK, INC.
SUITE # 201
414 PLAZA DR.
WESTMONT, IL 60559
ATTN: MARY JO WILLIAMS

WILLIAMS AND WENTINK, INC
SUITE # 201
414 PLAZA DR.
WESTMONT, IL 60559
ATTN: GLEN WENTINK

DESCRIPTION

DATE SAMPLED : 01-FEB-90 TIME : 12:15 PO NUMBER : HOLD
DESCRIPTION : STATION # 003-SLAG FILL

ANALYSIS

CID DIGESTION OF LEACHATE SAMPLES FOR FAA OR ICP SW846-3010
ANALYST : M. BEAVER DATE : 07-FEB-90 INSTRUMENT : MANUAL REP : 0
PREP : EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310

PARAMETER	RESULT	DET LIM
FINAL WEIGHT OR VOLUME	50 ML	
INITIAL WEIGHT OR VOLUME	50 ML	

ARIUM FAA SW846-7080
ANALYST : L. JANATKA DATE : 08-FEB-90 INSTRUMENT : FAA REP : 0
PREP : ACID DIGESTION OF LEACHATE SAMPLES FOR FAA OR ICP SW846-3010
PREP : EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310

RAMETER	RESULT	DET LIM
BARIUM	2.0 MG/L	0.2

H (SOIL) SW846-9045
ANALYST : H. GRIFFIN DATE : 05-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
PH	11.1 STD. UNITS	0.1

CID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS FOR FAA OR ICP SW846-3050
ANALYST : M. BEAVER DATE : 06-FEB-90 INSTRUMENT : MANUAL REP : 0

PARAMETER	RESULT	DET LIM
FINAL WEIGHT OR VOLUME	2.60 GRAMS	
INITIAL WEIGHT OR VOLUME	50 ML	

EXTRACTION PROCEDURE TOXICITY (EPTOX) SW846-1310
ANALYST : M. BEAVER DATE : 05-FEB-90 INSTRUMENT : MANUAL REP :

PARAMETER	RESULT	DET LIM
TOTAL SAMPLE WEIGHT	100 GRAMS	
SOLID PORTION	100 GRAMS	
LIQUID PORTION	0 ML	
INITIAL DI ADDED	1600 ML	
FINAL DI ADDED	0 ML	
INITIAL PH	10.6	
FINAL PH	7.7	
TOTAL ACID ADDED	400 ML	
VOLUME EXTRACT FILTERED	2000 ML	
TOTAL VOLUME FILTRATES	2000 ML	

BARIUM FAA SW846-7080
ANALYST : L. JANATKA DATE : 08-FEB-90 INSTRUMENT : FAA REP :
PREP : ACID DIGESTION OF SEDIMENTS, SLUDGES, AND SOILS FOR FAA OR ICP SW846-3050

PARAMETER	RESULT	DET LIM
BARIUM	3200 MG/KG	4.0

QUALITY ASSURANCE OFFICER: _____

B-3

SUMMARY OF SOIL ANALYTICAL RESULTS-HARDING LAWSON ASSOCIATES INVESTIGATION

TABLE 1
SUMMARY OF SOIL ANALYTICAL RESULTS FOR TCLP METALS - AUGUST, 1992
CONCENTRATION IN mg/L

Soil Boring	Depth of Sample (feet)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
SB-1	3.0 - 3.5	ND	3.27	0.008	0.025	ND	ND	ND
SB-2	4.0 - 4.5	ND	2.45	0.007	0.035	ND	ND	ND
SB-3	2.5 - 3.0	ND	4.13	0.007	0.025	ND	ND	ND
SB-4	3.0 - 3.5	ND	0.67	0.008	0.034	ND	ND	ND
SB-5	3.5 - 4.0	0.004	4.56	0.022	0.021	0.11	ND	ND
SB-6	3.0 - 3.5	0.002	2.40	0.007	0.025	ND	ND	ND
SB-7	5.0 - 5.5	ND	1.05	0.007	0.015	ND	ND	ND
SB-8	4.5 - 5.0	ND	2.29	0.009	0.020	ND	ND	ND
SB-9	6.0 -6.5	ND	1.29	ND	0.018	ND	ND	ND
SB-10	4.0 - 4.5	ND	1.29	ND	0.018	ND	ND	ND
SB-11	6.0 - 6.5	ND	1.16	ND	0.014	0.23	ND	ND
SB-12	6.5 - 7.0	ND	2.42	ND	0.014	ND	ND	ND
SB-13	4.0 -4.5	ND	1.00	ND	0.019	0.14	ND	ND
SB-14	5.5 - 6.0	ND	0.21	0.007	0.023	ND	ND	ND
SB-15	6.0 - 6.5	ND	0.36	0.006	0.028	0.10	ND	ND
SB-16	6.0 - 6.5	ND	0.75	ND	0.028	ND	ND	ND
SB-17	3.5 - 4.0	0.003	0.48	0.007	0.014	ND	ND	ND
SB-18	5.0 - 5.5	.003	0.73	0.007	0.032	ND	ND	ND
SB-19	5.5 - 6.0	ND	0.87	0.006	0.026	ND	ND	ND
SB-20	11.5 - 12.0	ND	1.83	0.008	0.098	0.13	ND	ND

TABLE 1 (cont)
SUMMARY OF SOIL ANALYTICAL RESULTS FOR TCLP METALS - AUGUST, 1992
CONCENTRATION IN mg/L

Soil Boring	Depth of Sample (feet)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
SB-21	4.0 - 4.5	ND	0.77	ND	0.025	ND	ND	ND
SB-22	6.5 - 7.0	0.01	1.19	ND	0.026	ND	ND	ND
SB-23	7.5 - 8.0	ND	1.66	ND	0.100	ND	ND	ND
SB-24	7.5 - 8.0	0.002	3.28	ND	0.012	ND	ND	ND
SB-25	7.0 -7.5	0.001	1.00	0.009	0.081	0.14	ND	ND
SB-26	5.0 - 5.5	ND	0.56	0.006	0.073	ND	ND	ND
SB-27	8.0 - 8.5	ND	0.47	0.009	0.063	0.33	ND	ND
SB-28	6.5 - 7.0	0.10	1.47	0.009	0.018	ND	ND	ND
SB-29	12.5 - 13.0	ND	3.67	0.012	0.107	1.20	ND	ND
SB-30	9.5 - 10.0	.002	1.69	0.010	0.070	0.31	ND	ND
SB-31	5.0 - 5.5	ND	3.21	ND	0.016	ND	ND	ND
SB-32	6.0 - 6.5	ND	151	0.006	0.015	ND	ND	0.014
SB-33	7.5 - 8.0	0.002	92	ND	0.015	ND	ND	ND
SB-34	9.5 -10.0	ND	0.98	ND	0.042	0.19	ND	ND
SB-35	6.5 - 7.0	0.010	1.92	0.009	0.020	ND	ND	ND
SB-36	3.0 - 3.5	ND	1.74	0.041	0.099	0.14	ND	ND
SB-37	6.0 - 6.5	0.003	142	ND	0.040	ND	ND	0.042
SB-38	8.0 -8.5	ND	57.74	0.009	0.063	0.43	ND	ND
SB-39	6.5 - 7.0	0.004	1.58	ND	0.029	0.14	ND	0.014
SB-40	7.5 - 8.0	0.002	0.56	ND	0.034	ND	ND	ND

TABLE 1 (cont)
SUMMARY OF SOIL ANALYTICAL RESULTS FOR TCLP METALS - AUGUST, 1992
CONCENTRATION IN mg/L

Soil Boring	Depth of Sample (feet)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
SB-41	9.0 - 9.5	ND	2.66	ND	0.105	ND	ND	ND
SB-42	4.0 - 4.5	ND	145	ND	0.126	ND	ND	ND
SB-43	5.0 - 5.5	0.004	535	ND	0.040	ND	ND	ND
SB-44	7.0 - 7.5	0.002	64	ND	0.025	ND	ND	ND
SB-45	7.5 - 8.0	0.16	3.64	0.098	0.020	ND	ND	ND
SB-46	7.5 - 8.0	0.002	4.63	0.008	0.066	0.18	ND	ND
SB-47	7.0 - 7.5	0.001	4.52	ND	0.056	0.11	ND	ND
FB-1	Soil	ND	1.19	ND	0.018	ND	ND	ND
FB-2	Soil	ND	1.57	ND	0.024	ND	0.002	ND
FB-4	Soil	ND	0.70	ND	0.017	ND	ND	ND
RCRA Toxicity Characteristics		5	100	1	5	5	0.2	5

NOTES: Concentrations in mg/L (milligrams per liter). Selenium was not detected in any of the samples. ND indicates not detected at the following Laboratory detection limits:

Arsenic:	0.001 mg/L
Cadmium:	0.005 mg/L
Lead:	0.10 mg/L
Mercury:	0.002 mg/L
Selenium:	0.002 mg/L
Silver:	0.01 mg/L

TABLE 2
SUMMARY OF SOIL ANALYTICAL RESULTS FOR ORGANIC COMPOUNDS - AUGUST, 1992

Soil Boring	Depth	Benzo (a) anthracene	Benzo (b) fluoranthene	Benzo (a) pyrene	Benzo (ghi) perylene	Chrysene	Dibenzo (a,h) anthracene	Flouranthene	Phenanthrene	Pyrene
SB-29	13' - 13.5	840	960	910	1,000	1,300	670	720	1,500	760

Notes:
- Concentrations in µg/kg (micrograms per kilogram).
- No other VOC or SVOC was detected in the remainder of the soil samples.